



# Small Business Networking & the Intel R440LX Server

One of the biggest growth areas in networking today is the small office network. In many cases 'learning to share' still makes economic sense. Individual businesses with anywhere from two to 50 users are finding it makes as much economic sense for them to share files, modems, printers, CD JukeBoxes, hard drive storage, and Internet resources as it does for large companies. For example, rather than buying a printer for each desktop, you can save money by purchasing one printer, attaching it to the R440LX server on the network and letting several people use it.

In a growing office, networking also allows you to take advantage of the increasing number of network applications, such as e-mail, Intranet collaboration, and database management. 'Learning to share' also makes practical sense in the small business area. Ask yourself about the last time you collaborated on a when members of the team were constantly exchanging floppy disks. Document revision control in that scenario can become a nightmare. After three-to-five days in the office each member has a copy of the file on their hard disk, with varying degrees of "up-to-dateness". Connecting desktop machines to a R440LX file server allows everyone to work on the same file on the same hard disk. This reduces redundant efforts by employees, increases productivity, and ensures everyone is current.



## Steps to a ‘Big Looking’ Small-Office Network

### **Plan ahead:**

- Decide which files, print resources and other I/O resources you want to share and who should have access to each resource. You will need to plan the file sharing down to the sub-directory level. Place any shared printers in a location where they will not disturb those people working nearby and away from heavy foot traffic areas.
- You will need to make sure an expansion slot is available for the type of network card (ISA or PCI) you plan to use in the Intel desktop or workstation you want to network.
- The R440LX server has an embedded 10/100Mbit Intel network controller on the baseboard. The server baseboard is also equipped with an onboard SCSI-2 controller, onboard video controller, and onboard IDE controller. With its four PCI slots and one ISA slot, the R440LX server baseboard has excellent I/O upgradability for modem cards, RAID controller cards, ISDN cards, or other specialized communication add-in cards.
- If you are connecting more than three machines, it is a good idea to get an office layout. This will save you hours of nonessential tedious work when estimating cable lengths.
- Plan your present network with future growth in mind. Are you planning on setting up the R440LX as a web server? You don’t need to worry about the dual Pentium® II processor ready R440LX server system... this little workhorse has plenty of headroom to take your business into the 21<sup>st</sup> century.

### **Physical point of a Network**

- If you plan to connect only two or three computers that will be very close together, you can run cables along the floor and behind desks. Try to keep cables away from areas where people walk.
- It is a good idea to have the network cables at 90-degree angles to power cords to prevent electromagnetic interference.
- PCI adapters network cards are recommended. They are faster, easier to maintain, upgrades are quick and they support Plug and Play.
- If you expect eventually to have more than a few R440LX servers or workstations in one location, use Category 5 cables and hubs. You may want to consider purchasing a rack and monitor / keyboard / mouse switch system.

- Ensure the R440LX server or desktop/workstation is turned off and disconnect the power cord before installing the second network.
- It is a good idea to touch grounded metal to discharge static electricity before handling the card.
- Install a network interface card (NIC) in each Intel desktop/workstation... refer to our integration guide which has detailed directions for adding an additional NIC in the R440LX server. In most cases you won't need the extra NIC, but it is nice to have the option.
- Before you install the network card drivers, test the configuration settings using the installation software to make sure there are no conflicts.

### **Connect the cables to the hub:**

- Place the hub in a central location. In larger offices, use the phone room or wiring closet. In smaller offices, put the hub on a desk or mount it on the wall.
- Each cable should have one end inserted into a port on the hub and the other end into the NIC in the R440LX server or workstation.
- Connect the hub to an uninterruptible power supply (UPS). You should also invest in a UPS for the R440LX server.
- Plug in the hub power supply and flip the on/off switch to 'On'. It is just that easy.

### **Software Portion of the Network; configure the Network Operating System (NOS):**

- Pick your protocols. It is a good idea to use IPX across the LAN. Installing TCP/IP requires a little more work and plan on your part, but is well worth it since you are able to easier connect to the Internet. The future growth aspect of TCP/IP also makes this protocol worth your time to consider.
- Follow the NOS documentation to set up shared drives, directories, printers, and any other resources attached to the R440LX server. Do not forget to plan and consider user privileges.

### **Microsoft Windows 95/Windows NT\***

Microsoft Windows 95 is a popular small-office NOS since it is found on many all Intel architecture desktop/workstation/server machines. It is not difficult to share printers, CD-ROM drives, and even the data on your local hard disks. Windows 95 also includes client software that lets you connect to other Network Operating Systems. Unfortunately, Microsoft does not offer any client software for DOS-based PCs, so Windows 95 is a useful NOS only if all your clients and servers are running Windows 3.11 or

later. Windows 95 should work fine as a NOS for two to seven desktop/workstation machines. Windows 95's backward-compatibility with legacy 16-bit applications may be a good fit for small offices running older software. If you are currently using Windows95 for peer-to-peer networking, you can migrate to client/server networking by adding the R440LX server system.

Another alternative associated with Microsoft and Windows 95 is Personal Web Server (PWS for Windows95 can easily handle the office load on an Intranet with 15-20 users. The Intranet files are stored on the Webmaster's hard drive while the 15-20 people on the LAN have read-only access through the web browser. Since PWS supports Common Gateway Interface (CGI) and Internet Server Application Interface (ISAPI), the system administrator can test applications on the R440LX server with PWS running before deploying to a larger webserver if required in the future. Because Windows95 and the FAT (File Access Table) file system are not designed with total file server security in mind, PWS should not be used as an Internet server for public use.

Windows NT Workstation includes a good base to set up a peer-to-peer network for three to ten users and can be installed on the R440LX server system. However Windows NT Workstation is not bundled on most desktops/workstations so expect to pay for each copy. Unlike Windows 95, this NOS includes several Internet/intranet utilities, including Web, FTP, and Gopher servers. If choosing Windows NT workstation for your client NOS you should consider running Windows NT server on your R440LX server.

## **Lantastic\***

A long-standing small office NOS on the market is LANtastic comes with a two-to-ten user license from Artisoft. LANtastic includes all of the software needed to connect your DOS, Windows 3.x, and Windows 95 PCs together. Artisoft has recently introduced a version for Windows NT. An interesting feature of LANtastic is the built-in modem-sharing utility called i.Share. The office can share a single dial-up or dedicated Internet connection with all the users on your network. Given its solid performance and all of these features, LANtastic is a worthwhile choice for a small network ranging from 2 to 50 users in an office where legacy machines with DOS and Window 3.X are prevalent.

## **Intranetware\* for Small Business**

Novell's NetWare and IntranetWare are usually considered high-end Network Operating Systems (NOS) for larger networks of a 10 to 100 desktop/workstations/servers. However, there is a new scaled-down version of the NOS from Novell called IntranetWare for Small Business (five-user license and five simultaneous connections). A dedicated server is required, but the future growth potential is built in both the NOS and server system. Novell claims that IntranetWare is easy to install, but like Netware, it does require special hard-disk partitions. There are thousands of Certified Novell Engineers familiar with the

nuances of setting up Netware systems, if you find the special hard disk partitioning confusing IntranetWare lacks a IPX-to-IP gateway and Multi-protocol Router. It does have a remote node server for connecting from a remote location and a new graphical network-management.

The remote node server, NetWare Connect, is also available as a stand-alone product for other versions of NetWare and IntranetWare. The client software is called Novell Easy Administration Tool (NEAT), and it is a lot easier to use than the standard NetWare Administrator found in the other versions. A helpful feature of the small business version is its ability to add licenses on a per-user basis. With the other NOS versions (i.e. Microsoft Windows95, Windows NT, and Artisoft's Lantastic), users must purchase license packs in quantities of five or more.

## More Popular Webservers

A survey performed by Netcraft took a detailed look at the Web server software usage on the Internet. The report surveyed 1,364,714 sites in September 1997 and determined:

apache	44.03%
microsoft	17.75% <sup>9</sup>
netscape	11.52%
other	10.65%
NCSA	4.90%
O'Reilly	3.15%

### Apache

The Apache server is a public domain product, which is likely why it is so popular in the Internet community. Apache's software has been ported to as many as one third of the 56 different version of UNIX available. A consortium of developers contribute their efforts to improving and enhancing the software, including a port to Windows NT.

Remember, you must compile the Apache server code on the R440LX server system... and the core apache server software really does not support secure connections. The consortium developers made a conscious decision not to support secure connections due mainly to the United States cryptography export restrictions. There are alternatives for a secure version available.

## Setting Up a Web Server

Setting up a Web Server for you small business may seem daunting at first. Certain essential logistical considerations must be established which all are related to network connectivity. The Internet service provider (ISP) should help to get everything on the list accomplished.

- Establish network connectivity between your machine and the Internet as a whole. In most companies, this connection will be in the form of a SLIP connection using 28.8Kbit/second modems, a router communicating via 56Kbit/second hard-wired modems on a dedicated leased phone line, or a network router communicating through a T1 (1Mbit/second) dedicated digital line.
- Assign an IP number to the R440LX server system which you are going to use for a Web server. When the company or network obtains Internet connectivity, it is allocated a range of IP numbers. Allocate one of the IP numbers of this range for your use.
- Assign a DNS host name for your World-Wide Web server. When your company or network obtains Internet connectivity, it is assigned a domain name and required to set up primary and secondary DNS servers. Most companies that use DNS servers have the ISP maintain these server machines.
- Assign individual names for each desktop, or R440LX server system, that have an IP number which are derived from that original domain name. Web servers are given names of the form www.xxxx.domain--for example, www.intel.com or www.peds.csmc.edu, so an individual web server's name within a company could be www.marketing.intel.com.
- "Bind" your Web server's name to its IP number and Ethernet ID so that Web browsers on other machines can connect the Web server by name. This requires an update to the tables on the DNS servers that are authoritative for your domain and (usually) propagation of those changes to the DNS servers maintained by your Internet service provider.

“Connecting to the Internet”, by Susan Estrada is a helpful book which explains the various performance and cost trade-offs of the different levels of Internet connectivity and includes a list of Internet service providers to provide turnkey connectivity solutions.

- Install a TCP/IP protocol stack on your workstation/desktop machine, if it does not have one already. TCP/IP stacks are built into Microsoft Windows NT, Apple Macintosh System, IBM OS/2 Warp, and all versions of UNIX. Protocol stacks are available for Microsoft Windows and earlier versions of the Macintosh OS.

- Configure your workstation's TCP/IP stack for the machine's IP number, and the IP numbers of the primary and secondary DNS servers for your network domain. The IP number of the machine or router that serves as your domain's "gateway" to the Internet as a whole is also required.
- Install a Web browser on the desktop/workstation system.
- Install the R440LX Web server. Connect the Web server to network with the workstation(s). Create a home page for your R440LX server. Web server software is available at no charge on the Web itself for a wide variety of operating systems. A great starting point to locate the software you need for your particular machine's environment is the World-Wide Web home page at CERN.
- Announce your Web server's existence to the Web at large. This can be done most efficiently by posting messages to newsgroups and mailing lists where people discuss topics related to the material you plan to publish on your Web server. As time goes by, administrators of other Web servers with similar interests will incorporate hyperlinks to your server into the content on their servers, making it easier for people to navigate to your R440LX based web server.
- You also need to be sensitive to the fact that your Web server will be construed by outsiders to represent the policies, attitudes, and intentions of the company that owns your server's domain name. It is a good idea to get an adequately empowered member of the company's public relations department to approve the Web server concept before you invest too much time in it. Also you should have the content on the server reviewed at reasonable intervals. The ante is small but the potential impact enormous if the content you provide is judged by the network community to be unique and valuable. Remember, when you put up a web server on the Internet, it can potentially be viewed by hundreds of thousands of people.
- If you work in a large company, your efforts to set up a publicly visible Web server may well run afoul of your company's security precautions. The Internet has earned an entirely justified reputation as the breeding ground of hackers and graduate students with too much time on their hands and no respect for privacy or ownership of information. Many companies defend their internal networks against intrusion from the Internet by setting up so-called "firewalls" that allow passage of only certain types of network traffic or, more frequently, allow users inside the company to make outgoing connections to other Internet resources but shield the company's own computers from incoming connections. In order for your Web server to be visible to the rest of the Internet, you will have to either allow HTTP traffic through the firewall or to place your Web server "outside" the firewall.

## Cables

Cables are the veins of a computer network. Data is pumped through these vein-like wires, delivering information from point to point. Two common types of cabling used today are; Unshielded Twisted Pair, (UTP) and Coaxial. The dominant cable installed in many companies today is UTP, yet coaxial cabling still has its merits in small peer-to-peer networks.

Available in Categories 3, 4, or 5... UTP is capable of handling traffic from 10Mbit/second to 100Mbit/second. Category 3 (Cat3) is used for telephone systems, while Cat4 and Cat5 are used mainly for telephone and data networks. For small office networks running 10Mbit/second Ethernet, Category 3 cabling is satisfactory. If you need the performance advantages of 100Mbit/second Ethernet, or if you expect the network infrastructure to grow significantly in the near future, go with Category 5 cabling. It really is not significantly more expensive than Category 3.

To connect your network over UTP, a hub is needed. Acting like a network's heart, the hub is located in the center of a 'hub-n-spoke' configuration. Individual cables are connected from the hub to each computer on the network. An alternative to UTP is one of the oldest cable types in the industry; Coaxial cable. Coax, still provides one of the easiest and inexpensive methods to network computers. Unlike Twisted Pair, Coax does not require a hub. Instead, each workstation/server is connected to another in a 'daisy-chain-like' configuration to create a network infrastructure bus. There are T-connectors on each computer used to link a section of coax from one workstation/server to the next. The disadvantage of Coax is that if any cable or adapter fails... the whole network infrastructure goes down. This is not true with Twisted Pair and o\*ne of the main reasons why business shy away from Coax cabling.

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